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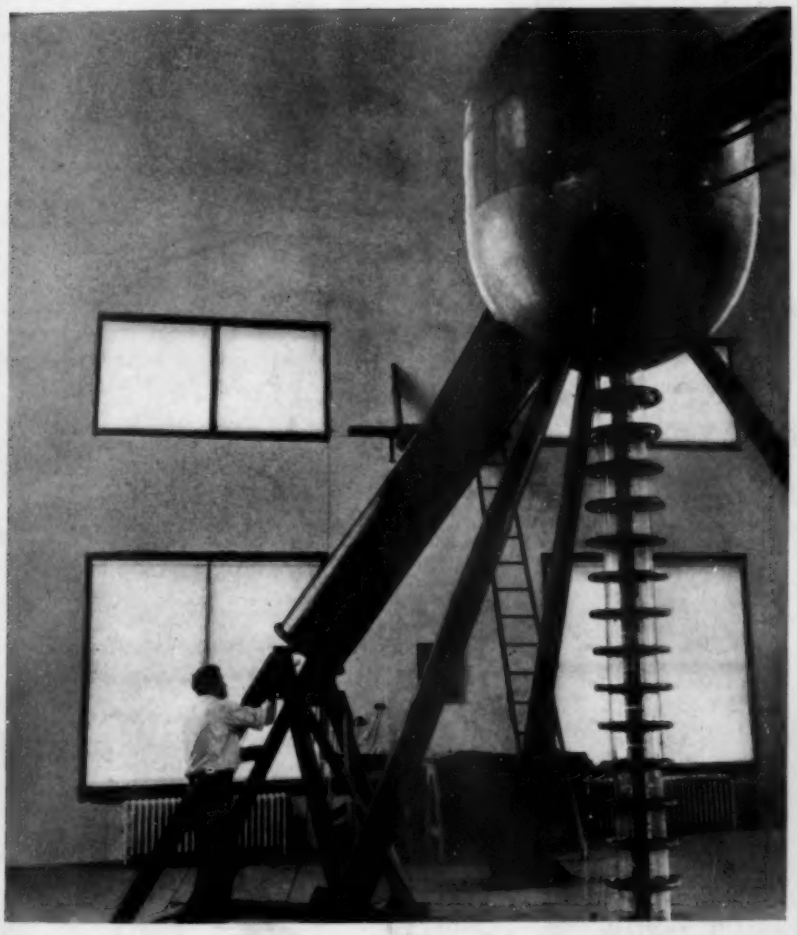
# SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



MAY 9, 1936

**Atom Smasher**

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A SCIENCE SERVICE PUBLICATION

# SCIENCE NEWS LETTER

*VOL. XXIX* *No. 787*

The Weekly Summary of

**Current Science**

*Published Every Saturday by*

**SCIENCE SERVICE**

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*Edited by* WATSON DAVIS

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# DO YOU KNOW?

Grapefruit seed yield a high quality salad oil.

A weather curiosity in London is that no rain has fallen on the morning of March 16 in the past 50 years.

A parasitic fly imported from Europe in 1931 is being used to fight earwigs that infest regions of the United States.

Braids and curled fringes of false hair were worn by Egyptian queens of the first dynasty over 5,000 years ago.

Talking movies of nursery school children are found helpful by educators studying child behavior.

Melons fully ripened on the vine can be shipped to city markets if the fruit is coated with paraffin wax when it is picked.

Archaeologists were reminded of the Bible story in which the jawbone of an ass was a weapon when they found in Moravia a spade-like tool made from the jaw of a wild horse, and used in the Old Stone Age.

A porcupine cannot voluntarily shoot its quills, but it may lose them in moulting time as a bird loses feathers.

Spinach is not "just spinach," says a New York crop specialist, for there are about 20 distinct varieties on the market.

Museums have found that original snake skins mounted are not nearly so lifelike as reproductions made of cellulose acetate.

Early explorers in America told of finding Indians keeping bees in hives for the honey and wax, and Indians raising cochineal bugs for red dye.

Among the devices for improving package goods, manufacturers have thought up non-drip spouts for medicine oil bottles, and non-slip bottles for furniture polish.

British archaeologists have at last put together and read a Roman tombstone, part of which has reposed unidentified in the British Museum since 1852, whereas the other fragment was dug up in London last summer.

## WITH THE SCIENCES THIS WEEK

***Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.***

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AVIATION

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Is there an instrument precise enough to measure an atom? p. 305.

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PSYCHOLOGY

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PSYCHOLOGY-PHYSIOLOGY

Is a monkey color-blind? p. 298.

RADIO-ASTRONOMY

How often do the new-found short wave radio fadeouts take place? p. 300.

MEDICINE

# New Weapon Against Cancer Possible in Neutron Ray

## Streams of Atomic Particles Unknown Before 1932 Found More Effective Than X-Rays for Animal Tumors

BECAUSE latest animal tests indicate that neutron rays (powerful streams of atomic particles totally unknown before 1932) are more effective than X-rays in killing animal tumors, it is possible that medicine is on the verge of applying a new weapon to human cancer.

Dr. John H. Lawrence of Yale University and Prof. Ernest O. Lawrence of the University of California reported to the American Society for Clinical Investigation, meeting in Atlantic City, the scientific data that raise the hopes of medical science for a more powerful weapon in its fight against cancer.

The Drs. Lawrence are brothers. Both are young men, in their thirties. Ernest is a physicist and he invented the giant cyclotron for producing high voltage atomic radiations with which he has obtained striking transmutations of the elements. John is a physician on the staff of the New Haven Hospital and he has pioneered in testing medically the new radiations produced.

Dr. John Lawrence explained to the medical scientists that new tests just completed in the University of California's radiation laboratory have indicated that, per unit of ionization, neutron rays are more effective than X-rays in killing one type of tumor in mice. The results will have to be confirmed by other experiments before definite conclusions can be drawn concerning the application of neutron radiation to human beings.

The Lawrence brothers are anxious not to arouse unjustified hopes among cancer sufferers. They emphasized that the application of neutron rays to human cancer is distinctly in the future. Even if all goes well in the experiments to be made it will be months and perhaps years before it will be possible to treat patients. They would not be talking now about their progress if they did not consider it important to inform fellow scientists.

Yet there is no question but that the outlook is enticing. Here is the way the scientists reason:

It is believed that the X-ray is relatively more lethal for cancer cells than for normal cells of the human body. Often it is impossible to give a large enough dose of X-rays to kill the malignant growth without doing damage to the patient. With this differential effect of X-rays, about 15 per cent of the cancer patients treated are cured or benefited. Suppose a radiation even relatively more lethal for cancerous than for healthy cells were obtained. The story would be different. A larger percentage of cancer patients treated could be saved. Neutron rays open up this possibility.

The tests reported by Drs. Lawrence were performed on a series of 600 mice of a strain which is peculiarly susceptible to a type of tumor known as Sarcoma 180.

The preliminary experiments indicate that the neutron ray is four times as lethal as the X-ray on this mouse tumor, but apparently only three times as lethal on healthy mice. This latter figure is less definite. Seven hundred to 750 roentgen units of neutron discharge will reduce the virility of Sarcoma 180 to a point where it will not grow when implanted in mice. On the other hand 3000 roentgen units of X-ray are required to accomplish the same result. This tumor resembles cancer in mice. Further experiments with true cancer in mice are in progress. There is a distinct possibility that neutrons will prove to be relatively more effective on tumor tissue than X-rays.

The idea that neutron rays might show a wide differential in their effect on different tissues was suggested by preliminary tests in the summer of 1935. The Lawrence brothers found that in changing the blood picture of rats the neutron ray was about five times as powerful as the X-ray. At the same time Paul C. Aebersold, who also was associated with the Drs. Lawrence in the present researches, and Dr. R. E. Zirkle of the University of Pennsylvania, demonstrated that in its effect on the tissues of wheat seedlings, the neutron ray was about ten times as powerful as the X-ray. From this it was sug-

*GEOLOGY IN CARDBOARD*

***Thin slices of the western Wisconsin landscape, each represented by a cardboard profile with the vertical elevations much exaggerated, formed a striking exhibit at the spring meeting of the National Academy of Sciences in Washington, D. C. The tremendous job of cutting and measuring, and the exacting topographic research behind it, were the work of Drs. Douglas Johnson (at right) and Robert E. Bates, of Columbia University. The area represented is the region where western Wisconsin, southeastern Minnesota, and northeastern Iowa touch corners. This region was not plowed over by the great glaciers of the Pleistocene, so that the landscape is now very deeply eroded.***

gested that there might be a similar difference in effect on various types of tissue such as animal tumors.

The neutron is a newcomer among the minute particles that compose matter. It was discovered in 1932 by Dr. J. Chadwick of Cavendish Laboratory, Cambridge, England, and the discovery was recognized by the award of the Nobel prize to Dr. Chadwick. It is considered to be one of the fundamental building blocks of atoms and it is notable because of its electrical neutrality, a quality that may have something to do with its seeming ability to penetrate more effectively into the center of atoms and living cells. In size it is far, far beyond the limit of visibility, as are all atoms. Its mass is approximately that of the lightest of atoms, hydrogen. Some scientists have suggested that it consists of an electron and a proton, the more familiar electrically charged particles, clinging together.

The neutron ray is therefore a stream of particles. The X-ray, on the other hand, is a radiation like radio waves and light, only with a frequency much higher, or to say the same thing, a wavelength much, much shorter.

*Science News Letter, May 9, 1936*

PHYSICS

# Scientists Describe Design of Fortress for Atom Study

## Half-buried Chamber, 60 Feet in Diameter, and Research Rooms Are Only Part of Elaborate Plans

See Front Cover

A VERITABLE fortress of science, that will have more than a passing resemblance to the famed "ring of steel" forts which France has built along its eastern border, is planned for early construction by the scientists of the Carnegie Institution of Washington.

A giant atom-smashing machine of the electrostatic type which will produce bombarding "bullets" of at least 10,000,000 volts energy will be built by Dr. M. A. Tuve of the Carnegie's Department of Terrestrial Magnetism, it was announced at the meeting of the American Physical Society in Washington. The construction of the new atom "fort" is comparable, in its field of atomic study, with the construction, 25 years ago, of the great 100-inch telescope which brought world-wide fame to Mt. Wilson Observatory of the Carnegie Institution.

A striking feature of the new design, said the report of Dr. Tuve and his colleagues, Drs. L. R. Hafstad and Odd Dahl, will be the use of earth, concrete and underground water-tanks to shield the delicate measuring equipment and the observing scientists from the potent, dangerous high-energy rays that the apparatus will produce.

A great high-pressure sphere, 60 feet in diameter, will be half-buried in the side of a hill with the high-voltage vacuum tube device inside. The underground target can be flooded with water for some experiments with piercing neutron beams. Scientists and their sensitive equipment will be located in yet another subterranean vault where they will watch what happens as the high-energy projectiles from the "fortress" strike atoms.

For the past few years the Carnegie scientists have been testing and experimenting with the predecessor of the proposed "fortress." With their machine, creating particles of energy 1,200,000 electron volts, they have demonstrated the feasibility of the new device which will yield particles with a minimum energy of 10,000,000 volts and perhaps even 15,000,000 volts.

The "bullets" from the atom fortress will be used to break through the "armor plate" of electric force which effectively—up to the last few years—has locked the secrets of atomic constitution within the nuclei of atoms. Only high-energy particles, the atomic "bullets," can pierce through the protective electric force and get inside the atomic cores.

The Carnegie Institution apparatus is a variation of the original atomic electrostatic generator devised by youthful Prof. Robert Van de Graaff of Massachusetts Institute of Technology. Prof. Van de Graaff at the same meeting announced that his device at Round Hill, Mass., can now generate potentials of 5,100,000 volts.

Prof. E. O. Lawrence earlier told the National Academy of Sciences that his atom-smashing apparatus—of quite a different type of construction since it whirls the particles round and round and gradually accelerates them—has just produced a particle beam with 11,000,000 volts energy. (*See SNL*, May 2.)

Thus on many fronts the battle of physicists, to wrest the secrets bound up in the cores of atoms, progresses.

The Carnegie Institution's proposed "fortress" is the latest of several types of equipment which are all directed to the same goal.

*Science News Letter, May 9, 1936*

GENERAL SCIENCE

# No Danger of Suppression of Science in America

NO PRESENT danger exists that scientific discovery and thought will be underestimated or suppressed here in America, in the opinion of Dr. Frank R. Lillie, president of the National Academy of Sciences, expressed in his annual message to that "senate" of American science.

"This condition should heighten our sense of responsibility to see that its power and authority are not exaggerated," he told the academicians.

The Academy remains "firmly founded on the bedrock of scientific research, and serene in confidence in orderly thought, whether for the understanding or control of the processes in nature and in man."

As to the future, Dr. Lillie declared that the true friends of science recognize that limitations are set in nature and in the mind itself to scientific progress. Its rate, direction or extent for any considerable period of time can not be predicted.

"Yet I think," said Dr. Lillie, "that experience should give us confidence to claim that the conquering spirit of science is one of the strongest components of ideal social processes; and always will be."

Dr. F. F. Russell, former director of

the Rockefeller Foundation's International Health Division and now a Harvard lecturer, was awarded the Academy's public welfare medal for his work on yellow fever.

Important oceanographic researches were recognized in the presentation of the Agassiz medal to Dr. T. Wayland Vaughan of the Scripps Institution of Oceanography in California. Dr. Vaughan has investigated corals, foraminifera and submarine deposits and he has been a leader in studying the Pacific Ocean area.

*Science News Letter, May 9, 1936*

GENERAL SCIENCE

# Revolver Shot Produces Definite Emotional Response

## National Academy Members See Slow Motion Pictures Of "Startle Pattern"; Hear Physiological Researches

AT THE CRACK of a revolver shot, even the most unemotional and stolid person reacts with a definite "startle pattern" that has not been discovered before because the human eye is not fast enough to catch it.

Presenting ultra-rapid motion pictures instead of a formal scientific paper at the scientific sessions of the National Academy of Sciences, Dr. William A. Hunt of Connecticut College for Women and Dr. Carney Landis of the New York Psychiatric Institute announced this discovery that promises to lead them to new facts on the neurophysiology of emotional behavior.

Never before had students of emotion been able to demonstrate the existence of definite patterns of emotional behavior, because they change so quickly. Ultra-rapid motion pictures, at four or more times the normal camera speed, when projected at a slow rate separate out two definite types of behavior.

### Two Patterns

First is a regular behavior pattern of great rapidity, coming and going in less than half a second. This is followed immediately by slower responses which are not regular and which change from time to time in any one individual and between individuals.

The first pattern, however, is universal, and some elements of it were found in all subjects studied. The camera is again proved quicker than the eye, and detects an immediate response which to visual observation has remained concealed by the individualized and socialized behavior following it.

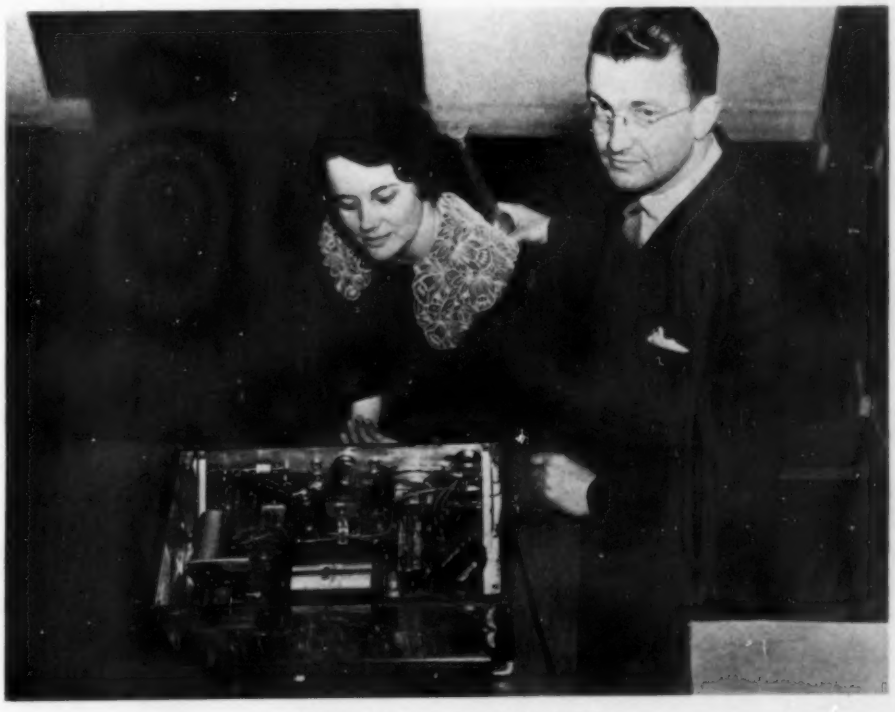
Even the most stolid person, when viewed by the camera, shows some elements of the first, rapid, universal "startle pattern." This pattern consists of a blinking of the eyes, bending forward of the head, stretching of the mouth as in a "grin," the muscles in the neck stand out, hunching of the shoulders, abduction of the upper arms, bending of the elbows, pronation of the lower arms, clenching of the fists, bending forward of the trunk, contraction of the abdomen, and bending at the knees.

All the elements are not found in every subject, Drs. Hunt and Landis reported, nor is the strength of the movement always constant, but every subject tested showed some elements of the pattern, and it developed in a regular course. The facial aspects are the most constant.

Apparently it is involuntary, as instructions to the subjects to inhibit the pattern and not to move, did not result in its disappearance. Some subjects showed rapid habituation with successive shots, with most of the pattern disappearing at the second shot. Others did not habituate and were shown to be still responding at the fifth shot. The response seems to be increased by the simultaneous use of the sudden flash of a photoflash bulb. It can also be increased by the injection into the subject of adrenalin. Instructions to hold the body tense did not seem to have any great effect upon the response.

### Body "Tunes In"

Not all ultraviolet light is the same in producing healing of rickets. Drs. John W. M. Bunker and Robert S. Harris of the Massachusetts Institute of Technology presented evidence that the body "tunes in," as it were, differently upon different wavelengths. For in-



***TESTING FOR RADIUM***

***A new radio-activity detection method 10 to 100 times as sensitive as older methods was demonstrated by Dr. Robley D. Evans, of the Massachusetts Institute of Technology, at the meeting of the National Academy of Sciences. (See SNL, May 2.)***

stance, equal energies of the line in the ultraviolet spectrum known as 2967 Angstroms cures in half the time required by lines 3025 or 2537.

### Elephants Are Cooler

The body temperatures of elephants are on the average more than a degree cooler than the temperature considerd normal for healthy, human beings. Drs. Francis G. Benedict and Robert C. Lee of the Carnegie Institution's Nutrition Laboratory at Boston reported that the elephant's body temperature is 35.9 degrees Centigrade (96.6 degrees Fahrenheit). Standard human temperature is 37 degrees Centigrade (98.5 degrees Fahrenheit).

### Infantile Paralysis Study

The tough and knotty question of immunity or resistance to dreaded infantile paralysis was discussed by Dr. Simon Flexner of the Rockefeller Institute for Medical Research, New York City. Very few persons ever suffer a second attack of infantile paralysis, he pointed out, the majority apparently acquiring immunity to it through the first attack. This is peculiar because the virus of the disease enters the body through the nose and uses the nerve of smell exclusively to reach the brain and spinal cord, Dr. Flexner said. Unlike other disease-causing agents, the infantile paralysis virus never comes in contact with the blood, although it is in the blood that immune substances are developed to protect man and animal from infectious disease. By reinfecting monkeys that have recovered from one attack of infantile paralysis, Dr. Flexner hopes to discover the body's mechanism for acquiring immunity to the disease.

### Energy in Yellowstone

An enormous store of energy exists beneath the surface of Yellowstone Park, Dr. Arthur L. Day, director of the Carnegie Institution's Geophysical Laboratory, told the Academy, in a lecture upon the famous hot springs of that national park. For the first time two borings have been made for information as to the actual conditions below ground. In one of these a temperature of 401 degrees Fahrenheit (205 degrees Centigrade) and a steam pressure of more than 300 pounds was developed at a depth of 250 feet.

*Science News Letter, May 9, 1936*

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Rats live in colonies of 10 to 100, and their burrows have only one entrance.

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Canadian scientists have devised a low-priced deep-sea thermometer for fishermen.

PHYSIOLOGY-PSYCHOLOGY

# Brain Waves Are Slower In Children Than in Adults

BRAIN waves, those electric impulses direct from the human brain, are slower in children than in adults, and may hold a clue to the time of brain development, Dr. Donald B. Lindsley, of the Brush Foundation, Western Reserve University, told the Midwestern Psychological Association meeting.

The brain waves known to scientists as alpha waves were "tapped" by Dr. Lindsley as they came from that part of the cortex believed to control vision. Records of 46 normal adults were compared with those of 50 children ranging in age from just a few weeks upward.

In adults, these waves occur at the average rate of about 10 per second. For women, the rate is slightly higher than for men, Dr. Lindsley found, and averages about 11 per second.

A 3-months-old child apparently does not have the waves at all. Somewhere between 3 and 6 months they start, and in a 7-month old baby come at the rate of about four and a half per second. At 9 months, they have speeded up to 5 per second; at 13 months, to 6 per second.

The frequency for the five-year-old is between 6 and 7 per second; and for the 12-year-old they have reached adult level.

The absence of the alpha waves in very young babies and their time of starting at between three and six months was especially interesting to the investigators.

"Since infants usually begin to perceive objects and follow them across the visual field at or shortly after 3 months of age," Dr. Lindsley said, "We believe that the onset of alpha waves at about this same time may indicate some relationship with this functional ability.

"It appears that the onset of alpha waves in young infants somewhere between 3 and 6 months may be coincident with the first tendency of the child to perceive objects or to follow them across the visual field. If this is true, the presence of the alpha waves might be considered an indication of the onset of function in the particular brain area investigated."

*Science News Letter, May 9, 1936*

PSYCHOLOGY-PHYSIOLOGY

# Monkeys Equal to Humans In Vision for Color

MONKEYS are not color-blind as are some of the lower animals. New scientific evidence of this was reported by Dr. Walter F. Grether, of the University of Wisconsin, speaking before the meeting of the Midwestern Psychological Association in Evanston, Ill.

In tests in which the animals were taught to find food in a box illuminated by a patch of light of the color being studied, Dr. Grether found that the color vision of both old- and new-world monkeys is very little if any different from that of normal man.

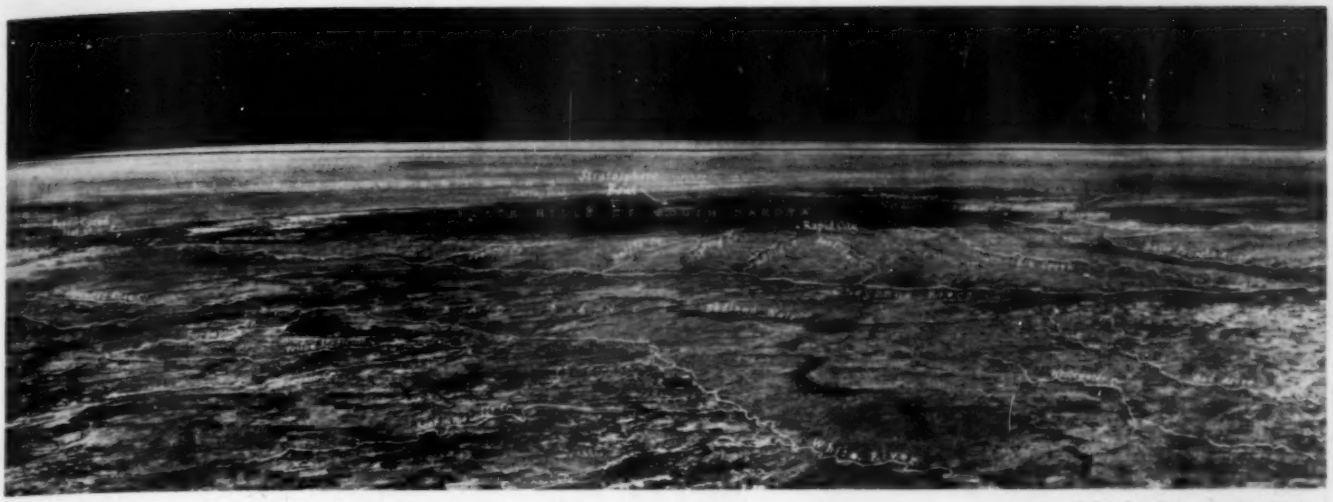
These results have significance in connection with theories of evolution, Dr. Grether pointed out. This is because they show a high degree of similarity in the color vision of widely separated branches of the primate order, which includes man, the great apes, and the monkeys.

Scientists have known that the color vision of pigeons also approximates that of man, he indicated. He further said:

"Since lower mammals have very rudimentary color perception at best, it would seem to follow that this visual function has evolved independently in mammals and birds. Yet the final stage of this evolution appears to be almost identical in the pigeon, high monkeys, and man.

"This suggests that for color vision the course and outcome of evolution was not a result of chance variations, but was imposed by some fundamental properties of optic and nervous structures, and the nature of the stimuli which these structures became adapted to analyze."

*Science News Letter, May 9, 1936*



© National Geographic Society

***FROM ABOVE***

***The stratosphere voyager looks at a sky that is black and an earth that is unmistakably curving. This view of the Black Hills and surrounding landscape was taken high above the ground from the stratosphere balloon Explorer II, and is reproduced by special permission from the National Geographic Magazine.***

PHYSICS

# Scientists Describe Results Obtained in Stratosphere

## Electrical Conductivity of Air Above 60,000 Feet Does Not Increase With Altitude; Gases Measured

THE UNTOLD story behind the record-breaking stratosphere flight of the balloon Explorer II last year was revealed at the meeting of the Philosophical Society of Washington when the scientists who built instruments for the experiments and tested the strength of the craft before it left the ground told of their work.

Among the apparatus carried aloft in the 72,395 feet ascent of Capt. Orvil Anderson and Capt. Albert W. Stevens in the National Geographic Society-U. S. Army Air Corps balloon was the equipment of O. H. Gish for measuring air conductivity. This was from the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

The ease with which the air conducts electrical current, said Mr. Gish, rises steadily from ground level to 60,000 feet, where it is 60 times as great as at the surface of the earth. From 60,000 feet upward, however, the conductivity is surprisingly low.

The conductivity not only fails to increase but even decreases slightly. This finding may have importance for cosmic ray studies, since above 20,000 feet altitude cosmic radiation is the main contributing cause of air ionization, and hence of air conductivity.

Between 20,000 and 60,000 feet, Mr. Gish indicated, cosmic rays can now be said to explain satisfactorily the conductivity recorded in the new observations.

Three possible causes may account for the unexpected air conductivity found above 60,000 feet:

(1) The cosmic ray intensity may decrease between 60,000 and the 72,395 foot peak elevation.

(2) Above 55,000 feet the path of the balloon appears to have entered an entirely different air mass from that in which it started. Under 55,000 feet the Explorer II was in a mass of air which was of polar origin; above this point it entered air which had come from the tropics. Polar and tropical air, said Mr. Gish, have differences of conductivity.

(3) Above 60,000 feet the balloon entered a region where the ozone content is greater. Ozone is known to affect the mobility of the air ions on which conductivity measurements are based and thus might account for the lack of conductivity increase above 60,000 feet.

The composition of the stratosphere air was described by G. M. Shepherd of the National Bureau of Standards. The helium content of the stratosphere air is very much too high, he indicated, to be accounted for by the separation of gases which gravity would bring about. Helium was found in a concentration of 300 parts per million of gas. Contamination of the helium samples from the helium of the balloon was anticipated and is suspected in the measurements.

The ratio of the amount of oxygen to nitrogen obtained in the stratosphere air samples is slightly different from that expected, Mr. Shepherd said. The possible origin of these differences is still under study. If the difference turns out to be real, it would indicate that a separation of the two gases due to gravity is occurring at the altitudes reached.

W. G. Brombacher, also from the National Bureau of Standards, revealed that the automatic instruments carried aloft brought back a complete "life history" of the epochal flight in terms of barometric pressure and time.

There is a difference of some 175 feet, he said, in these barometric altitude records and the official height reached by the Explorer II. This difference arises because the official figures are measured from the center of the inflated balloon, while the barometric pressure was read 175 feet below.

The use of the vertical camera to measure altitude, Mr. Brombacher declared, yielded results in good accord with the pressure records.

The strength and performance of the stratosphere balloon was described by Dr. L. B. Tuckerman of the National Bureau of Standards.

Significant in the performance of the balloon, Dr. Tuckerman indicated, was the use of the ballast chart from which Capt. Anderson could determine what amount of ballast would be required for a safe landing.

*Science News Letter, May 9, 1936*

PHYSICS

## Thick Concrete Walls Protect Against X-Rays

THICK concrete walls are being used at the Rock Island Arsenal instead of lead sheeting to protect workers from X-rays generated in a 300,000 volt tube used for studying possible flaws in welding repairs.

A. C. Hanson, M. P. Christensen and R. J. H. Cochran, technicians from the Rock Island Arsenal Laboratories, reported to the meeting of The Electrochemical Society in Cincinnati that a wall of concrete two feet thick corresponded to over an inch of lead in X-ray stopping power. Adequate protection, they found, was provided by such a wall.

The saving in cost over lead was considerable. The lead alone would have cost $5,000 and labor costs to install it another $2,000. The extra-thick concrete wall cost only $1,000 more than the ordinary eight-inch wall which would have been used anyway.

*Science News Letter, May 9, 1936*

MEDICINE-AVIATION

## Aeroneurosis, Disease of Airplane Pilots, Reported

NOW comes aeroneurosis, a new disease occurring only in airplane pilots.

Dr. Harry G. Armstrong, captain in the U. S. Army Medical Corps, stationed at Dayton, Ohio, describes this special form of functional nervous disorder in a long report. (*Journal, American Medical Association,* April 18.) He reports 18 cases of the disease in the 163 pilots who have been under observation for three years.

Unfortunately the disease is likely to attack the best men in the flying service. Usually a pilot has been flying ten or fifteen years before he develops aeroneurosis. The chief cause is profound emotional stress resulting from the accident hazards of flying and from economic and social insecurity. Possibly there is destruction of nerve tissue.

Chief among the symptoms of aeroneurosis are irritability, stomach distress, sleeplessness, ceaseless activity and depletion of the higher mental centers. It takes more than a doctor to treat the disorder properly, in Dr. Armstrong's opinion. The best medicine, he thinks, is suitable compensation, "either ego-stimulating or monetary."

Among the 163 men Dr. Armstrong has been studying, ten died—one from natural causes and the other nine in airplane accidents. The hazard per hour while they were flying was 216 times the hazard per hour when they were not flying, he found.

Early in a pilot's service he begins to realize that his career is in jeopardy, Dr. Armstrong explains. Every minor accident or disease may mean he cannot pass the semi-annual physical examination. This brings emotional stress.

The pilot reaches the peak of efficiency early in life. The man of 30 or 40 sees a lad of 20 outmaneuvering, outlasting and outdaring him. This deflates his ego, for it means that he soon will be grounded, losing face or caste and taking a large cut in salary.

Other stresses plague the pilot: The powerful instinct for self-preservation buried deep in the unconscious; the instinctive fear of falling and of loud noises, and the required concentration unsurpassed by any other occupation.

The Army doctor's principal recommendation is not medical. It is that the pilot who is grounded from flying but otherwise fit should be given a flying disability retirement and allowed to assume an executive or administrative ground position. He believes that this plan, in conjunction with adequate pay for the risks involved, would allow the majority of pilots to pass through their flying career free from aeroneurosis.

*Science News Letter, May 9, 1936*

RADIO-ASTRONOMY

## Solar Eruptions Affect Radio Transmission

VIOLENT eruptions on the surface of the sun occur at the same time the new-found short wave radio fadeouts take place, Dr. J. H. Dellinger, National Bureau of Standards, told the joint meeting of the Institute of Radio Engineers and the International Scientific Radio Union in Washington, D. C. Dr. Dellinger is the discoverer of the fadeout phenomenon which, up to now, has been a baffling problem in certain short wave communication. It appears every 54 days.

The radio fadeouts occur on the sunny, or daytime side of the globe, but not on the night side. Solar eruptions—but not necessarily the familiar sunspots—now appear to occur simultaneously.

The inference, in the new discovery, is that the ultraviolet light emitted from the sun affects the radio reflecting layers of charged particles (the ionosphere) which are miles above the earth's surface.

*Science News Letter, May 9, 1936*

# IN SCIE

MEDICINE

## Champion Blood Donor Gave 98 Transfusions in Year

RAYMOND BRIEZ works in the public markets of Paris, but he also has a thriving business of his own. He engages in the manufacture of blood, and since he entered the business in 1924 he has sold 257 quarts.

The output of Briez's human factory—his own body—is enormous when one considers that it takes only 7½ quarts of blood to fill the blood vessels of an adult man. During 1935, Briez manufactured enough blood to supply himself and to give 98 transfusions. Each transfusion averaged 10 ounces.

The champion blood donor of Paris started his manufacturing business in a small way. In 1924 he gave blood for four transfusions. The next year his orders jumped to 38. In 1927 the number of transfusions supplied by him attained the astonishing figure of 94 and from that time until 1935 he averaged from 50 to 60 a year.

No ill effects have been noted, and Briez is always ready for another call, according to the Paris correspondent of *The Journal of the American Medical Association* (April 25).

*Science News Letter, May 9, 1936*

BIOLOGY

## Support For Birth Control Method in Chimp Studies

SUPPORT for the birth control method known as the "safe period" or rhythm method was given incidentally by observations on chimpanzees reported to the National Academy of Sciences meeting by Dr. Robert M. Yerkes of Yale University's Laboratories of Comparative Psychobiology. In hundreds of chimp matings the beginnings of life occurred only during a period of about six days at approximately the middle of the feminine sexual cycle. Because the chimpanzee is very close to the human in physiological processes, Dr. Yerkes expects that research upon human reproduction will benefit from the studies upon these simian creatures.

*Science News Letter, May 9, 1936*

# EE FIELDS

PSYCHOLOGY

## Brain Injuries Change Rats' Way of Learning

HOW injuries to the brain may interfere with learning is indicated by experiments with rats reported to the Midwestern Psychological Association meeting in Evanston, Ill., by Dr. I. Krechevsky, of the University of Chicago.

The manner in which learning takes place in the injured animals was the subject of the study rather than their ability to solve any given problem.

The injured animals tend to do the same thing over and over and to lack versatility or variety in their responses even though the injury may be a relatively minor one.

They also show a loss of ability to work out some general method of attack for a problem. According to an analysis of the normal learning process previously made by Drs. Krechevsky and E. C. Tolman, of the University of California, these two factors are all-important—first, the ability to hit upon some generalized mode of attack for the problem and second, a versatility or plasticity that will enable the individual to try first one possible solution and then another until the best answer is found.

Apparently, even slight injuries affect both these factors and the loss is in proportion to the size of the injury.

*Science News Letter, May 9, 1936*

GEOLOGY

## Geology Knowledge Needed For Building Safe Dams

FLOOD destruction and peril, this spring as in many other past springs, were greatly increased by dams giving way under unprecedented loads of water. Yet their safety could have been assured, and the safety of dams now planned simply must be assured, by calling into council the bedrock knowledge of the geologist.

So contended Dr. Charles P. Berkey, professor of geology at Columbia University, speaking to the American Philosophical Society in Philadelphia.

"Experiences in connection with recent destructive floods," said Dr. Berkey, "have re-emphasized the importance of the safety factor in large engineering structures. As usual, the destructiveness of recent floods was greatly increased by failure of dams, and consequent emptying of large reservoirs into already swollen streams.

"An occasional instance of this kind in past history has had tragic consequences, but out of the reaction has come marked improvement in the placing and treatment of such works. No longer are the shortcomings of human planning charged wholly against nature. Safe structures can be built if the natural physical conditions are accurately known and if the design and construction methods take full account of these conditions.

"Modern engineering structures have developed to larger and larger proportions, and as a consequence the question of public safety has become a vital element in their planning. In this field, the geologist, with knowledge of foundation conditions, is a large contributor."

*Science News Letter, May 9, 1936*

SEISMOLOGY

## Earthquake Shakes Honduran Seacoast

A MODERATELY severe earthquake shook the northern coast of Honduras early on Monday morning, April 27, seismologists of the U. S. Coast and Geodetic Survey announced, after studying reports gathered from a number of seismological observatories by Science Service. The epicenter was located in approximately 16 degrees north latitude, 87 degrees west longitude, and the earthquake began at 1:30.8 a.m., eastern standard time. This location is not far from the Honduran port of La Ceiba.

Observatories reporting to Science Service were those of the Franklin Institute in Philadelphia, the University of Wisconsin, Georgetown University, Fordham University, Canisius College, and the stations of the U. S. Coast and Geodetic Survey at Chicago, Ill., and San Juan, P. R.

The North Pacific ocean southward from the Aleutian Islands was rocked by a submarine earthquake Thursday afternoon, April 23, at six hours and 14.4 minutes, eastern standard time, it was announced by the U. S. Coast and Geodetic Survey.

The epicenter of the shock was at latitude 48 degrees north and longitude 179 degrees west.

*Science News Letter, May 9, 1936*

AVIATION

## Discovered New Type Of Airplane Vibration

A SEVERE type of vibration, of a kind hitherto unknown in airplanes, has been discovered in a fast, high-performance combat plane of the Nation's air forces. The cure for the vibrations—which "rattle the pilot's teeth"—has already been found and should result in improved pilot operation of the aerial fighting forces of the United States.

Dr. L. B. Tuckerman and Dr. Walter Ramberg of the National Bureau of Standards in Washington were the scientists who found, and cured, the fault. Before the meeting of the American Physical Society they told how they discovered it.

The two-blade propeller of the fighting plane, they indicated, sets up air impulses with a frequency of 3,200 per second. The wings of the airplane take up a vibration, due to air impulses, of just half as much—1,600 vibrations a second. The wings, in turn, set up vibrations in the airplane tail structure of 800 vibrations per second.

Vibrations between wing and tail, in the ratio of two to one, would be dangerous if they stayed exactly that. Actually the ratio is not quite two to one steadily, so that beat frequencies occur which sometimes cancel and at other times augment each other. It is the addition of the wing and tail vibrations which "rattle the pilot's teeth," said Dr. Tuckerman.

### Two Changes

Two things cured the plane of its vibrations. The wing and tail surfaces were slightly altered so that the vibrations were less near the critical two to one ratio, and further, a three-blade instead of a two-blade propeller was installed.

The vibration discovery, said Dr. Tuckerman, probably is not a serious problem in a large airplane of the commercial transport type but seems to appear only in the tiny, powerful combat planes.

Solving the problem was of tangible importance, however, not because there was any particular danger of the airplane shaking itself apart but rather that the removal of the annoying vibration brought greater comfort to the pilot. And increased comfort means that the pilot can fly better, shoot better and do all his other flight tasks in an improved fashion.

*Science News Letter, May 9, 1936*

***COMMUNICATION OF THE FUTURE?***

***Dr. G. C. Southworth, Bell Telephone Laboratories, New York City, stands beside the new experimental "piped" radio waves which travel inside the long tubes free from outside static and without interference to nearby receivers. In his hand Dr. Southworth holds a receiving unit which detects the electric waves after they race through the guide tubes with velocities near that of light. The electric waves used with the guide tube systems are only six inches long and are of the frequency that might possibly be used for television.***

PHYSICS

# Scientist Predicts Nature of Communication of Future

A BRIEF but amazing glance at scientific experiments which foreshadow what communication of the future may be like with radio waves only six inches long was presented before radio engineers and physicists by Dr. G. C. Southworth, Bell Telephone Laboratories, New York City.

Speaking, by invitation, before a joint meeting of the American Physical Society and the Institute of Radio Engineers holding their spring meetings in Washington, D. C., Dr. Southworth described his studies of a new form of wave propagation along guide lines. The electric waves used were of extremely high frequency and, indeed, beyond any wave frequencies used for communication today. The fundamental nature of Dr. Southworth's waves makes them akin, in one sense, to radio waves but instead of being broadcast in all directions through space they travel along specially constructed guides from point to point.

But before jumping to the assumption that the guiding system is like a telephone or telegraph wire, warned Dr. Southworth, it should be realized that the wave guides are like nothing so far used for the purpose in communication. Instead of consisting of electrically-conducting wires, the wave guides are composed of hollow metal tubes. The waves travel along inside nine-tenths as fast as light on insulating material which will not conduct an ordinary electrical current.

The waves, being inside what is essentially a metal shield, have little external effect on nearby instruments and in turn are almost completely free from static and other noise troubles caused by outside interference. These two points alone indicate the difference between the present system and ordinary radio where interference between stations and annoyance from static are a major problem.

In his lecture, Dr. Southworth was wary of too-enthusiastic predictions about the immediate practical importance of the new system as a means of communication.

The following possibilities, even though in the future perhaps, cannot be overlooked:

1. The electric waves used are in the range of frequencies higher than television now uses.

2. With a decrease in the size of the guiding tubes the system should be practical for long distance transmission of the waves (communication).

3. A communication electric wave system free from static and outside interference, which conceivably could be "piped" from place to place and interlace in a fashion not greatly different from the network of telephone wires now in use, might be built.

### For Short Distances

"The situation at present," declared Dr. Southworth, "is that the art at these extreme frequencies is not yet at a point which permits a satisfactory evaluation of practical use. However, for short distance transmission or for use as antennas or projectors of radio waves or for selective elements analogous in nature to the tuning elements so commonly used in radio, there are not the same economic conditions limiting the size of the structure. For such uses, then, structures of this type (wave guide tubes) deserve serious consideration."

The electric waves used in the Bell Laboratory experiments were 15 cm. in length, or about six inches. Special types of radio oscillators, known as Barkhausen tubes, are used to generate the short waves.

For detecting elements at the other end of the experimental guide tracks, Dr. Southworth used a trap-like chamber in which was inserted a variation of the old-fashioned crystal and "cat's whisker" detector. The tiny current picked up by this detector was led to a sensitive galvanometer which measured the intensity of the current.

What surprised the physicists and radio engineers who listened to the lecture was Dr. Southworth's statement that "there is no return current path, at least of the kind that is commonly assumed in ordinary transmission."

*Science News Letter, May 9, 1936*

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Lateral curvature of the spine occurs in eight girls to one boy.

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Experiments indicate that cured cheese can be fast-frozen and defrosted without injuring the quality.

PSYCHIATRY

# Social Method of Treating Mental Illness Encouraging

## Mentally Sick Patients Respond to Treatment in Groups; Ban on Capital Punishment for Youths Urged

ENCOURAGING results from treating mentally sick patients in groups of from two to seven rather than individually were reported by Dr. Paul Schilder, Bellevue Hospital, New York City, at the joint meeting of the American Psychiatric Association and the American Psychopathological Association at St. Louis, Mo., this week.

The method, termed "truly social" by Dr. Schilder, has already given good results with children. Dr. Schilder's report this morning was based on experience with adult patients suffering from a great variety of mental ails, many of whom had previously received other forms of treatment. The cases were severe and mostly of long standing. The patient had individual interviews with the psychiatrist as well as the advantages of the group discussion of his own and other patients' problems. As part of the treatment each patient, after preliminary discussions, was required to write a detailed history of his life. This personal history formed a basis for other parts of the treatment.

### Winning Confidence

Making friends with the mentally sick patient is a necessary first step in treatment of his illness, Dr. Lewis B. Hill of Baltimore told the meeting.

Only after the patient feels the physician is his friend can he be taught to understand what is wrong with him, why he is mentally sick, and then how to overcome the conditions that make him sick.

The process of making friends with the mentally sick patient, however, is not easy. Such a patient has "lost the ability to enjoy satisfying and enriching friendly relationships," Dr. Hill explained. His self-regard has been seriously reduced and he no longer expects to get pleasure out of any situation. Consequently he does not have the usual motive for trying to get well, which is the expectation of enjoying life again.

Before the physician can be a friend to the patient, he has to build up the patient's willingness or desire to accept and give friendship. To do this, the physician must be careful not to hurt the patient's self-regard. He must manage the treatment so that the patient feels it is a treat. By such means and by a steady friendly attitude, the physician can restore the patient's self-confidence and break down his attitude of caution and of being on the defensive. When by this method the patient is brought to the point of making friends with the psychiatrist, he shows a peculiar talent for making effective use of psychoanalytic methods which give him insight into his condition.

### Children's Problems Solved

Puppet shows and group classes in puppetry, art, music and other group projects proved a surprisingly helpful method of handling children with mental and nervous disease, mental defects and behavior problems, Dr. Lauretta Bender of Bellevue Hospital, New York City, reported.

The group method of handling these children was started through necessity because of the large number of child patients and the small staff at the hospital. But it was found to have a definite advantage over individual treatment in getting at the children's difficulties and in helping them to solve emotional conflicts. Many children showed definite evidence of improvement in their behavior difficulties although they had little contact with the psychiatrist. A routine program of various group activities, including school classes, supervised play and the like, kept the children busy and happy and satisfied their growing needs, emotionally, physically, intellectually and socially. At the same time the psychiatrist, although keeping a supervising eye on all the children, was able to concentrate his time on the most difficult cases.

### Thyroid Helps Epileptics

Treatment with thyroid gland extract is beneficial in some cases of epilepsy, Dr. Calvert Stein of Monson State Hospital at Palmer, Mass., reported at another session devoted to problems connected with epilepsy and other disorders in which convulsions—"fits" in popular language—are the chief feature. Dr. Stein has been trying various gland extracts in the treatment of epilepsy. Most useful is the thyroid extract, though he pointed out that it does not benefit all epileptic patients. Those whom it does help are improved in general health and thereby have fewer epileptic seizures than before treatment. This does not mean that the seizures were due to any defect of the thyroid gland. The improvement, Dr. Stein explained, is probably due to the fact that the thyroid extract gives additional stimulus to normal functioning throughout the body, since the thyroid is naturally a powerful regulator of body activity and functioning.

### Crime Problem Discussed

A ban on capital punishment of youthful criminals, regardless of the type of crime they have committed, was strongly urged by Dr. Baldwin L. Keyes of Philadelphia.

In the Middle Ages, Dr. Keyes pointed out, such executions of the young were frequent. Executions of adolescent criminals in the United States in recent years shows that little progress has since been made in methods of controlling youths who commit serious offenses.

Dr. Keyes asked the Association to take official action on the matter, such as requesting the American Bar Association to consider steps leading to abolishment of legal execution of criminal offenders under 21 years of age.

An improved method for examining alleged criminals to determine whether they are suffering from mental, nervous or personality disorders was reported by Dr. Lowell S. Selling of the Psychopathic Clinic of the Recorder's Court of Detroit.

The formal psychiatric examination used in clinics and physicians' offices takes too long and is otherwise unsuitable for use in making criminological examinations for courts, Dr. Selling pointed out. Most defendants are unwilling to talk because it is not in their interest, so the usual direct questioning has to be supplanted by indirect and concealed questioning. It is difficult to get a spontaneous life history except in the case of forgers "who were more than anxious to tell everything about their lives, but it was seldom truthful and less frequently worth anything." To save time and to get better cooperation, Dr. Selling has adopted the plan of having the defendants write their autobiographies. Some of the usual tests were

found unsatisfactory for criminological examination because they involved the use of blocks, which the defendants thought silly.

In part of his test Dr. Selling uses three types of formal psychiatric tests: the group intelligence test, the neurotic inventory, and a standardized inventory of special abilities or traits.

Sex offenders are the hardest to examine, Dr. Selling said. Unless much care is taken, these will seldom give enough information to enable the physician to get a real understanding of the case. About 85 per cent of these at the beginning of the examination deny categorically that they have committed the crime of which they have been convicted.

### Glands May Make Children "Bad"

When a boy, or girl, is so "bad" that his behavior constitutes a problem, the fault may lie with the child's glands of internal secretion. About one-fourth of the boys in an institution for delinquents had some disorder of the endocrine glands, Dr. Matthew Molitch of Jamesburg, N. J., reported. This suggests, in Dr. Molitch's opinion, that there may be some relationship between behavior problems and the endocrine glands, and shows the need for further study.

The pituitary gland, important director of body activity, was functioning abnormally in almost half of the boys Dr. Molitch described. These boys were either too short or too tall for their age. Some were overweight and some were tall, thin and weak. Some had delayed sexual development. A small group had underactive thyroid glands. The intelligence of the entire group showing glandular disorders was not very different from that of the other boys in the institution, but the boys with glandular disorders were more unstable and troublesome than the rest.

### Breathing Reveals Personality

The manner in which a person breathes is as characteristic as his handwriting, Dr. Franz Alexander of Chicago told the meeting.

The fact that emotions influence breathing, excitement sometimes making a person breathe faster, for example, is well known. With Dr. Leon J. Saul, Dr. Alexander investigated this, examining the manner of breathing of 300 mentally sick patients and of normal persons and patients suffering from diseases other than mental.

They found, among other things, relationships between a pause in breathing and a certain type of neurotic reaction; between slight interruptions of breathing and digestive tract disturbances; between still another type of breathing, characterized by inspiratory spikes on the charted curve of breathing, and certain poorly repressed, unconscious desires.

Is there a really normal person and, if so, where is he?

This question was raised by Dr. L. W. Darrah of the Gardner, Mass., State Colony.

If such a paragon as the normal person does exist, he would probably be a mediocre, uninteresting chap, it appears from Dr. Darrah's remarks. All the glib talk about "normal minds," "acting normally," or "doing things in a normal way," has little meaning, since no one apparently knows just what "normal" is. Almost everyone, Dr. Darrah pointed out, seems to have an idea of what an abnormal person is, but no one has tried seriously to describe or define the almost mythical normal person. Many textbooks do not even list "normal" in the index.

*Science News Letter, May 9, 1936*

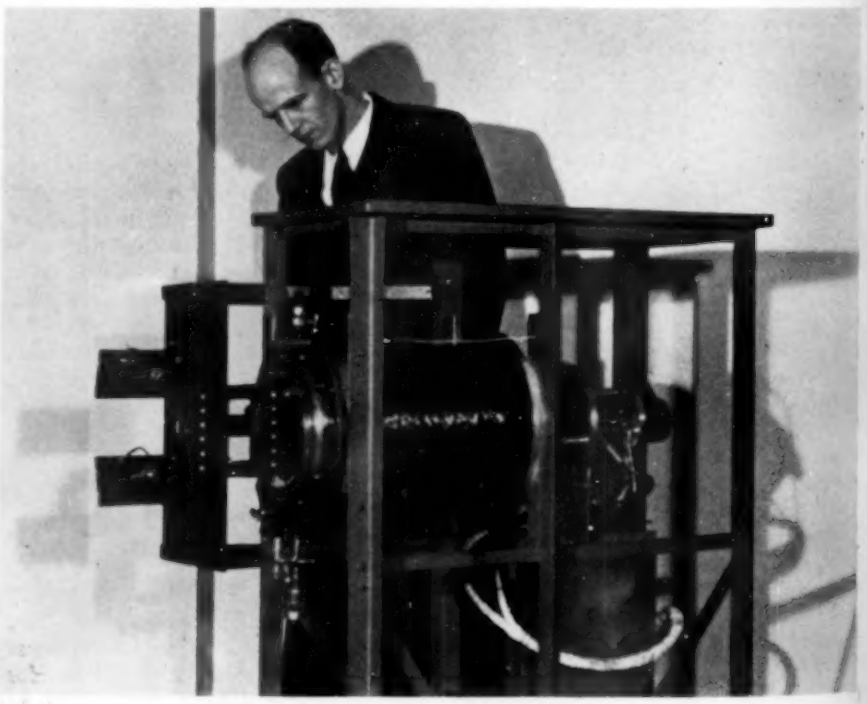
PHYSICS

# New Design of Cloud Chamber Cuts Weight over 900 Pounds

THE WILSON cloud chamber apparatus, which is one of the most potent tools of science for taking actual photographs of the breakup of atoms, has been redesigned into an instrument which weighs only 76 pounds, declared Dr. Gordon L. Locher of Bartol Research Foundation of the Franklin Institute before the American Physical Society. Hitherto, cloud chamber apparatus have been unwieldy, heavy instruments weighing hundreds and even thousands of pounds. It was in such an instrument that Dr. Carl Anderson first discovered the new atomic particle, the positron.

Dr. Locher's variation of the famous instrument was designed for the stratosphere flight of Dr. and Mrs. Jean Piccard. He constructed a similar one for the last stratosphere flight of the Explorer II of the National Geographic Society and Army Air Corps. It is semi-automatic in operation and is made of lightweight Dowmetal.

The new lightweight instrument should find wide use in studies of



*LIGHTWEIGHT CLOUD CHAMBER*

nuclear disintegrations and cosmic radiation, especially in balloon flights and for observations on high mountain peaks where it is with only the greatest of difficulty that the ordinary, heavy type of equipment can be set up.

Dr. Locher expressed the belief that one of the greatest benefits to be derived from cosmic-ray studies will be the eventual correlation of cosmic-ray nuclear disintegrations with those produced by laboratory means. He showed cloud chamber photographs of some of the 185 cosmic-ray disintegrations he has obtained in paraffin, boron, and lead. Those from paraffin show paths of massive nuclear particles that do not resemble anything produced by radioactivity or by laboratory disintegrations. An explanation of their origin awaits further investigation.

*Science News Letter, May 9, 1936*

PHYSICS

# New Electric Device Detects Distances Less Than Atom Size

## Intense Audible Sounds Found to Produce Light, Physicists Are Told; Eruptions in Atoms Described

SCIENCE'S first chance to make measurements directly of individual atoms, which are the smallest particles of the elements, promises to come from a new ultra-precise measuring instrument.

An electric ultramicrometer capable of detecting displacements of less than a billionth of an inch with an accuracy to a few per cent was described at the American Physical Society meeting in Washington by Prof. J. C. Hubbard of The Johns Hopkins University. It is believed the apparatus will be applicable to studies of atoms by direct observation.

The detecting apparatus, said Prof. Hubbard, is an electrical circuit containing a quartz plate resonator roughly similar to those used in broadcast transmitters for controlling the frequency of radio signals.

The quartz plate, in the fashion used by Prof. Hubbard, is extremely sensitive to small frequency changes. "A number of applications of this sensitivity to frequency variation suggest themselves," declared the Johns Hopkins professor, "perhaps the most interesting applying to measurement of small displacements of an ultramicrometer plate in the exciting circuit."

### Ten-Billionth of an Inch

Displacements of $10^{-9}$ cms. (less than a billionth of an inch) have been measured to a few per cent, the accuracy depending upon the absence of mechanical disturbances. By suitable mechanical insulation it is expected that displacements less than one ten-billionth of an inch may be measured.

"Such distances," Prof. Hubbard explained, "being much smaller than the dimensions of individual atoms, it is believed that a number of problems of great interest in atomic and molecular physics will now be open to study by direct observation."

### Eruptions In Atoms

A phenomenon corresponding to microscopic volcanic eruptions in bits of tungsten ribbon covered with thorium, and used in vacuum tubes, has been discovered at the Bell Telephone Laboratories, New York City.

In reporting to the American Physical Society, A. J. Ahearn and J. A. Becker described their studies of these thorium eruptions with an electron microscope.

On heating the thoriated tungsten filaments to temperatures as high as 4,000 degrees Fahrenheit, the Bell Laboratory scientists found that the filament surface was covered with little "active" areas which erupted and migrated over the surface of the pockets of thorium.

### Two Trillion Atoms

From measurements of the currents in their equipment they estimate that about 50 billion thorium atoms are involved in such eruptions. Each little pocket of thorium, they estimate from calculations, contains from ten billion to two trillion thorium atoms.

The studies were made to determine, if possible, the process whereby the thorium atoms are distributed over the tungsten surface of the filament. This knowledge is basic in the field of filament emission in radio and other vacuum tubes.

### Sound Creates Light

Intense audible sounds have been found to produce visible light in fourteen different liquids in the spots where cavitation occurs, said Dr. L. A. Chambers of the University of Pennsylvania Medical School.

Cavitation is the phenomenon occurring in water, for example, at the blades of swift-moving ship's propellers. Holes or empty spaces are created in tiny spots within the fluid. These evacuated spaces collapse suddenly and the liquid comes together with an impact which causes a high, momentary increase in pressure. The resulting effect in the case of propellers is a pitting and erosion of the metal surfaces. Steam turbine blades face the same difficulty.

Dr. Chambers creates the cavitation holes in his experimental liquids by the intense audible sounds with frequency ranging from 1,000 to 9,000 cycles per second.

In the regions where the cavitation was occurring he found that visible light is emitted by the liquid. An adequate explanation is still lacking but it seems probable that the atoms of the fluid are sufficiently excited in the process to emit light.

*Science News Letter, May 9, 1936*

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ANTHROPOLOGY

# Measurements Show Changes in Faces of Growing Children

## Physical Anthropologists Learn That All Newborn Babies Are "Unfinished"; Glands Determine Body Build

CHILDREN'S faces and heads change a great deal as they grow. Measurements that reduce casual observations of these changes to definite scientific record were the basis of discussion at the meeting of the American Association of Physical Anthropologists in New Haven, Conn.

Dr. Charles B. Davenport of the Carnegie Institution of Washington told of measurements made on the changes in noses and chins of children between the ages of six and eighteen. Taking the total distance from the top of the nose to the point of the chin as the basis of his measurements, Dr. Davenport found that nose height, in white children, takes up between 40 and 50 per cent of this. Chin length varies from less than 35 per cent to more than 50, while the height of the upper lip accounts for the remaining 15 per cent.

During development the nose length tends, in most cases, to occupy a progressively larger proportion of the face. Sometimes, however, it does not grow as fast as the rest of the face, while the chin increases in length.

### Lower Face Last

Other face measurements on young people were reported by Drs. M. S. Goldstein and F. L. Stanton of New York University Dental College. They narrowed their subjects down to a single racial group, measuring only Jewish children. Among these, they found, faces grew most rapidly in length, next in width, and least rapidly in depth. The upper face ceases growing apparently after the fifteenth year, whereas the lower face continues to grow.

The same two researchers also made a study of the movements of teeth in the growing jaws of children. Between two and seven years, teeth tend to migrate backward; after that they move forward again. The first permanent molars, especially the lower ones, show a special tendency toward forward movement.

Double-exposure photography, usually a comic accident with most amateur snapshotters, is used deliberately for scientific purposes by Dr. H. M. Halverson of Yale University. He first photographs the profile of a sleeping baby, then at the same focus photographs an accurately ruled-off grid. By repeating this at intervals on the same child, he can make a continuous record of its facial growth, with all its changes, and the squares photographed onto the same negatives give a ready and rapid means of detecting and measuring changes.

### All Babies Premature

"Man is born prematurely as well as immaturely," in comparison with his nearest of kin among the animals, Dr. Adolph H. Schultz of the Johns Hopkins University told the meeting.

Although man is born 266 days after his life-development begins, as compared with 236 days for the chimpanzee and 166 days for the macaque monkey, he still comes into the world most precociously, as compared with these, when consideration is taken of the much shorter lives of apes and monkeys, and the far more rapid rate of reaching maturity in these animals.

Newborn monkeys have their bones much more "bony" than those of newborn babies, and the "soft spot" on the top of the newborn human infant's head is not found on the top of a brand-new ape or monkey; it is closed up before birth. Newborn macaque monkeys cut their first teeth within five weeks at most, whereas human babies do not usually produce a tooth before they are six months old. In general, the human infant is born still very much in need of a lot of "finishing" that has already been accomplished for its jungle cousins.

### Glands Make Quixotes

Long, lean, active, imaginative individuals have more gland secretions circulating in them than have their short, fat, easy-going, physiological opposites, Prof. Raymond Pearl of the Johns Hopkins University told the meeting.

A single exception to this rule is found in the case of the thymus gland, an organ in the upper part of the chest that is very large in infants but diminishes in most adults. All other glands of internal secretion—sex glands, thyroid, adrenals, pituitary, pineal and parathyroids—are larger in what Prof. Pearl designated as the asthenic type, "the tall, spare, lean, Don Quixote sort of folk." Bigger thymuses and smaller other glands were the possession of the "pyknic" type—"the short, rotund, stocky, Sancho Panza folk." The intermediate physical type, called "athletic," have intermediate conditions in their gland development.

"These results," Prof. Pearl added, "are equally apparent in both sexes, and in both whites and Negroes."

### Toeprints and Fingerprints

Toeprint patterns are just as individually characteristic as are fingerprints, Dr. Marshall T. Newman of Western Reserve University reported. Dr. Newman studied 100 European-American men, and supplemented his findings with others made on 100 Japanese and 1,000 Chinese.

Among other points brought out by the study was the odd fact that the toeprints of a given individual are similar to his fingerprints, but mirror images of them. That is, if the whorls or loops swing to the right on the fingers, they swing to the left on the toes of the corresponding foot. This might indicate, Dr. Newman suggested, that right-handed persons are somewhat left-footed.

Toeprints, he continued, show racial differences as clearly as do patterns of the fingers, palms, and soles. Here the differences between the two Asiatic groups and the European-Americans are considerable; between the two Asiatic groups the differences are slight.

*Science News Letter, May 9, 1936*

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Finding a recently-dead basking shark 28 feet long on a beach near Prince Rupert, British Columbia, appears to solve a "sea serpent" mystery in that region.

**THE IDENTITY THEORY**
**By Blamey Stevens**

The only postulate of the Identity Theory is that space and time are identical and differ only in the number of their dimensions. The constancy of the velocity of light follows directly from this postulate, whereas it does not do so from the space-time continuum postulate of the Relativity Theory.

***$2.00, postpaid.***

*Published by Sherratt and Hughes, Manchester, England*

**Order from author at 438 West 116th Street, Apt. 66, New York City**

## ●RADIO

*May 12, 2:15 p. m., E.S.T.*

**OVER-OCEAN AIR SERVICE IN THE MAKING**—Edward P. Warner, Aviation Consultant.

*May 19, 2:15 p. m., E.S.T.*

**AMERICA GROWS OLDER**—Dr. Warren S. Thompson, Director of the Scripps Foundation for Research in Population Problems, Miami University.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

PHYSIOLOGY

## Summer Sun Has Six Times Burning Power of Winter's

SUMMER sunshine, in an average northern-U. S. locality, has six times as much power to start sunburn as has winter sunshine. Measurements reducing a commonly but inexactly known fact to a more precise quantitative basis were reported by Dr. H. Landsberg of Pennsylvania State College, before the meeting in Washington of the American Geophysical Union.

Dr. Landsberg used an instrument known as a "climatological ultraviolet dosimeter." It is a simpler apparatus than its long name might imply, and it measures the length of time required for sunlight to bring on the reddened skin that is the first symptom of sunburn. In central Pennsylvania, the time was about 32 minutes in summer, while in the winter more than three hours of exposure would be required. The amount of ultraviolet in the sunlight is very much less when the sun is low in the sky, as it is even at noon in winter.

The color of the sky as well as the height of the sun has a great influence on the burn-producing power of the light. On days when the sky is a deep, clear blue the sunlight has much less sunburning power than it has on days with a pale, whitish-blue sky. Also, the number of minute dust particles in the air influence the amount of ultraviolet that comes through.

Migrating air masses, from the poles and from the tropics, have much to do with the amount of sunburning we get. Most of our sunburn comes in summer, when tropical air masses dominate our weather; polar air masses have a low total sunburn score, but that is largely because they are around in the winter, when the low sun has much less burning power. When a polar air mass comes swooping down in summer, its clearer atmosphere lets more ultraviolet through.

*Science News Letter, May 9, 1936*

## ●First Glances at New Books

**Zoology**

PIGEONS AND SPIDERS — Maurice Maeterlinck—*Norton,* 128 p., $1.75. Two essays by Maeterlinck, a long one about the water spider and a shorter one about the life of the pigeon, written in the poetic diction which the world has come to expect of the great Belgian essayist.

*Science News Letter, May 9, 1936*

**Natural History**

ANNUAL REPORT OF THE DIRECTOR TO THE BOARD OF TRUSTEES FOR THE YEAR 1935—*Field Museum of Natural History,* 416 p., $1.

*Science News Letter, May 9, 1936*

**History of Science**

AN ANALYSIS OF THE DE GENERATIONE ANIMALIUM OF WILLIAM HARVEY—Arthur William Meyer—*Stanford Univ. Press,* 167 p., $3. Harvey's fame rests in most men's minds on his discussion of the circulation of the blood; yet that was by no means the only scientific work he did. He carried out, with great pains and patience, elaborate researches on embryology, and wrote a treatise on them. Yet strangely enough, not until now has a thoroughly critical and exhaustive study been made of this work of the famous English physician. Decidedly a scholar's book, Prof. Meyer's treatise will appeal to a limited audience but an appreciative one.

*Science News Letter, May 9, 1936*

**Botany**

FIELD BOOK OF ILLINOIS WILD FLOWERS—W. B. MacDougall and others—*Illinois Natural History Survey,* 406 p., $1.50. It is gratifying to be able to report the appearance of this excellent addition to the growing literature of state and regional floras. This book is announced as "Manual 1" of the Illinois Natural History Survey. The Survey has set a high standard for succeeding numbers in the series.

*Science News Letter, May 9, 1936*

**Sociology**

RURAL SOCIOLOGY; Vol. 1, No. 1, March, 1936—Quarterly, $2. per year. *Pub. by the Rural Sociology Section, American Sociological Society.* Address subscriptions to Managing Editor, Rural Sociology, Louisiana State Univ., Baton Rouge, La. A new journal, filling a hitherto unoccupied place in the field of sociology. It will be welcomed not only by sociologists but by all interested in rural life in America and in means toward its improvement.

*Science News Letter, May 9, 1936*

**Engineering**

DIESEL ENGINES, OPERATION AND MAINTENANCE, A PRACTICAL TEXT ON THE CONSTRUCTION, OPERATION, AND REPAIR OF HEAVY-DUTY ENGINES—L. H. Morrison—*American Technical Society,* 212 p., illus., $2.25. Many illustrations help explain the subject matter of this volume, whose lengthy title tells its scope.

*Science News Letter, May 9, 1936*

**Embryology**

HOW ANIMALS DEVELOP—C. H. Waddington—*Norton,* 127 p., $2. The author's stated purpose is "to write an account of embryology suitable for the intelligent layman and the elementary student." As a rule, this double objective is a hard one to attain; it is a real test of expository skill, to steer between the Scylla of textbookishness and the Charybdis of popular "jazzing up." But Dr. Waddington passes, with flying colors.

*Science News Letter, May 9, 1936*

**Natural History**

NATURE—BY SEASIDE AND WAYSIDE —Mary G. Phillips and Julia McNair Wright—*Heath.* I, Some Animals and Their Homes, 142 p., 64c.; II, Some Animal Neighbors, 187 p., 68c.; III, Plants and Animals, 244 p., 72c.; IV, Our Earth and Its Life, 280 p., 76c. A series of simply, brightly written science readers for children in the lower school grades, following the lines of a similar series first brought out years ago but so revised as to constitute practically a new group of books.

*Science News Letter, May 9, 1936*

**Ethnology**

WAPPO ETHNOGRAPHY — Harold E. Driver—*Univ. of California Press,* 42 p., 50c. Describes the culture of Indians typical of central California, stressing the geographic influences.

*Science News Letter, May 9, 1936*

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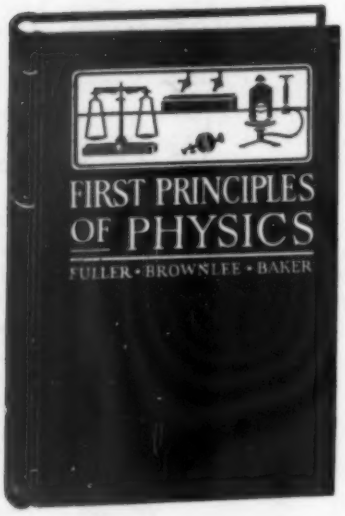
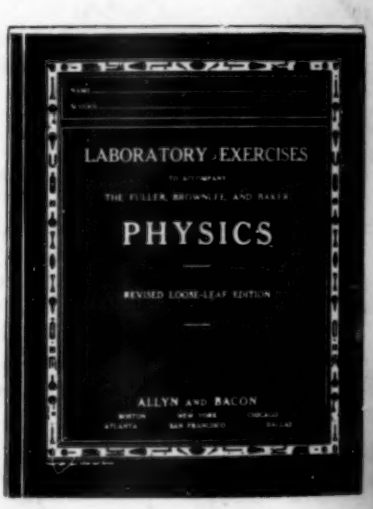
# FRONT PAGE NEWS

THE SCENE was Pittsburgh on a September day in the year 1868. There was a wild clatter of horses' hoofs, the banging and scraping of wagon wheels, the terrifying roar of an approaching train, and the piercing screech of a locomotive whistle.




Tugging at the reins and swinging his whip, the frantic driver rose to his feet. A lurch of the wagon, and he was thrown to the tracks. The train was less than 1,000 feet away.

Suddenly, there was the shriek of steel against steel as the brake-shoes ground against the wheels of the cars and the train slid to a stop, less than four feet from the body of the man across the tracks. George Westinghouse had proved the efficiency of the air-brake.




Today, the accomplishments of physicists are front page news. The radio, the airplane, the automobile,—everything that moves is in the province of Physics. The possibilities which the future unfolds will be largely predicated by the achievements in the world of Physics.

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